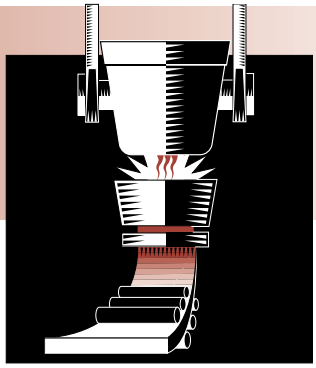
STEEL

Project Fact Sheet



Temperature Measurement of Galvanneal Steel

Benefits

- Energy savings of 1.3 trillion British thermal units (Btu) per year
- Cost savings of $7.2 million annually
- Increased mill yield of one percent
- Improved mechanical properties

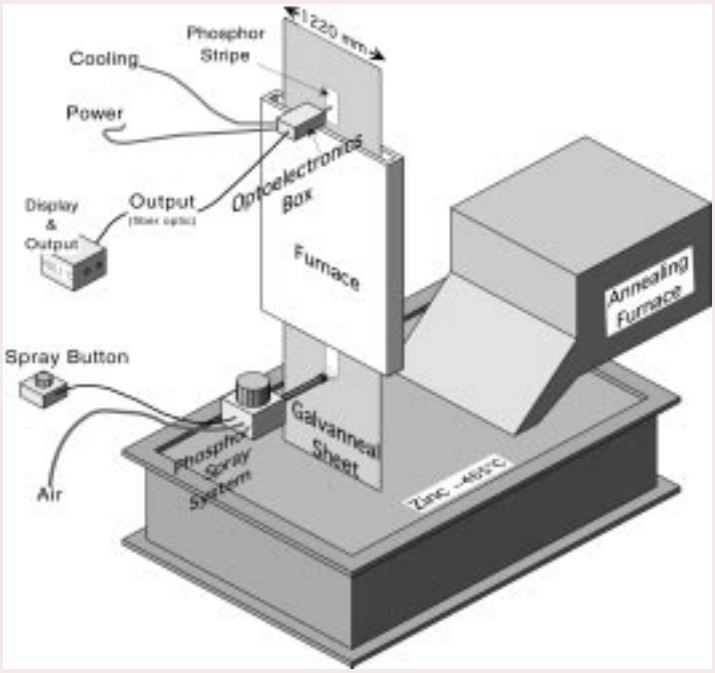
Applications

This technology will bring remote, real-time, emissivity-independent temperature measurement in furnaces, hot or cold rolling lines, and processing vessels to better than five degrees Farenheit (°F) accuracy from 20 to 3,000 degrees Kelvin(°K). It is appropriate for precise process control in hot, EMI, or corrosive environments due to measurement robustness. Long-term applications include monitoring refractory in furnaces, measuring melt temperatures, measuring roll temperatures on casters or in the hot mill, and monitoring various coating processes. This technology is currently being tested at Weirton Steel and should be commercially available in the summer of 1999.

Temperature measurement of galvanneal steel yields accurate on-line temperature control of the galvannealing furnace

The overall intent of this temperature measurement technology is to allow on-line, emissivity-independent temperature measurement of irregularly shaped or moving surfaces with temperatures up to 1,500 degrees Celcius (°C). The technique is particularly well suited for abrasive and chemically reactive exhaust gas environments or high electromagnetic interference (EMI) fields due to its remote nature. The fluorescent phosphor material that is applied to the surface of interest has been demonstrated to attain thermal equilibrium in less than point five seconds and has been successfully removed or overcoated with no residual damage to the steel surface. As this technology matures, the technique will become available in a very compact size at an affordable price. Alternative implementations might include a fiber optic probe device that will allow immersion measurements to be made with similarly high robustness and accuracy.

Phosphor Thermometry System



This schematic of the phosphor thermometry system displays the major components and their relative positions.

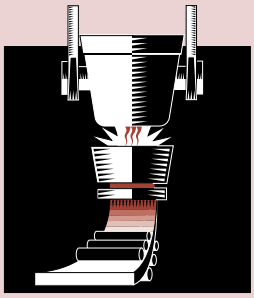
Project Description

Goal: Increase yield and energy savings through more accurate temperature measurement of galvanneal steel.

The goal of this project is to provide fast and accurate temperature feedback to the mill operator. Faster feedback on galvanneal quality will reduce product variability. Reduced variability will result in reduced down-grading of product which translates into higher operating profits and reduced energy consumption. The annual operating cost to the steel industry is approximately $6 million. There is also an estimated cost of $500,000 per year incurred for downgraded material. More wide-scale deployment of this technology to better control the thermal history of steel throughout the manufacturing process could increase the impact by two- to three-fold resulting in a total return on investment to the industry of $20 million per year.

Progress and Milestones

- The initial in-plant demonstration took place in the fall of 1996.
- The first prototype system provided on-line temperature data with five ^{o}F accuracy.
- The phase II effort was initiated in the summer of 1998. This effort was aimed at significantly improving robustness and the accuracy of measurement, while reducing instrument size, instrument weight, and ultimate cost.
- The phase II demonstration is scheduled to begin in February of 1999.
- Commercial availability is expected for the fall of 1999.



Project Partners

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